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## MECHANIZATION OF ENGINEERING AND CONTROL OPERATIONS

-USSR-

Following is a translation of an unsigned article in Planovoye Khozyaystvo (Planned Economy), No 9, Moscow, September 1960, pages 92-95.

In our country tremendous work is taking place in the mechanization and automation of all branches of industry. Hundreds of new automatic production lines, tens of automatic shops, whole automatized factories have been put into operation during the last few years. The production jobs of workers are thus more and more mechanized and automatized. But the work of engineers and technicians, designers and draftsmen, rate-setters and employees of the administrative-control apparatus -- a whole army of workers, numbering about 10 million people -- is almost not mechanized at all.

Meanwhile, in conditions of incessant development of productive forces, further expanded socialist production, and increasing speed of technical progress, the control of the economy becomes more and more complicated, requiring mechanization and automation of engineering-technical and administrative-control work. The development of remote control, electronics, and the introduction of mathematical machines create tremendous possibilities for mechanizing the engineering and control work.

These questions were examined at the recent All-Union Conference on Mechanization of Engineering-Technical Workers' Jobs and the Administrative-Control Apparatus. In it participated engineers, designers, and leading workers of enterprises, sovnarkhozy, state committees, ministries, and departments.

V. N. Starovskiy, chief of TsSU (Tsentral'noye statisticheskoe upravlenie -- Central Statistical Adminis-

tration) read a report entitled "Mechanization of Engineering-Technical and Administrative-Control Work." He outlined the basic tasks and measures for further mechanization of accounting, economic-planning, project-design and engineering-technical work.

For these purposes in the next few years the nomenclature and production of calculating machines and computers, and the serial output of highly productive electronic computers suitable for the mechanization of accounting-statistical, planning and computing work, will be significantly increased.

Electronic computers can be effectively utilized in working out reports, including interbranch balances; in a number of economic-planning estimates, including the compilation and analysis of interbranch connections; balances; finding out the proportions between interconnected branches of production; for calculating the effectiveness of capital investments; and in many other cases. Electronic computers release hundreds of thousands of people from making preliminary calculations.

A very important problem is the mechanization and automation of projects design, in which over 800,000 people are occupied. Automatization and mechanization of this work assures such an increase in design workers' labor productivity, that the increasing volume of work could be fulfilled by the personnel available, or by augmenting it but little.

Calculations show, that the use of methods and means of copy-less drawing in only 50% of the project documentation to be processed permits freeing 20-25,000 copyists, giving a savings of up to 200 million rubles per year in wages alone.

The chief task in mechanizing the work of engineers, technicians, and designers is to free them from unproductive computations for creative, productive work.

Yu. E. Maksarev, deputy chairman of the State Scientific-Technical Committee USSR, discussed the current situation and outlook in the mechanization of projects, design, and technological work, which are the chief reserves for stepping up the pace of creating new techniques and technology. This problem has inter-branch significance.

With the aim of developing mechanization of design, construction, and technological work, said comrade Maksarev, it is necessary to simplify in every possible way technical documentation and to shorten its forms; to develop and introduce a single model system of drafting; to develop and provide projects design work with quality materials, instruments and devices. At the same time it is necessary to work

out standards which set the extent and methods of the required calculation work by the corresponding parts and assemblies of machines and apparatus; to create and introduce specialized means for the complex mechanization and automation of engineering-technical work in designing, technical, economic, and normative computations, etc. The following should be organized: the output of means for mechanizing technological processes, drawing up of technological charts, rate-setting, etc.; production of technical means for quantity reproduction of various types of technical documentation; development of mechanized means for searching out necessary information, and also the manufacture of machines which automatically translate foreign technical literature.

The application of special electronic machines to economic-planning work has great significance. These machines possess the "memory," speed and accuracy to analyze masses of preliminary figures, and in these qualities surpass human capabilities. The working out and compilation of plans entails processing a tremendous amount of mathematical data. Calculating machines are able to analyze initial data, to accomplish tens of thousands of computing operations per second. They can provide systematized and analyzed information on virtually a limitless quantity of materials. This immeasurably broadens the possibilities of creative work by planner-economists, for it frees the brain from memorizing and making initial analyses of that huge amount of factual material which it is necessary to learn when working up plans.

The report of M. Ye. Rakovskiy, chief of the Computing Center, Gosplan USSR, dealt with application of electronic computers and other computation techniques in planning.

The utilization of computing-problem solving machines, said the speaker, will result in a significant economic effect. First, the quality of economic computations increases sharply, allowing the best variation to be picked out from many. Second, automation of planning computations shortens by 5-10 times the time necessary for drawing up plans, which is very important. Third, there will be a gradual improvement in the forms of control over the economy.

A thorough study of the dynamics of socialist economy demands that the masses of figures be gradually summarized according to such indices as utilization of the country's basic funds, growth of labor productivity, rational distribution of capital investments, etc. The present computing techniques, containing tremendous unused potentialities, can help here. With a small number of medium general-pur-

pose computers the Computing Center can replace tens of thousands of qualified human computers and carry out calculating operations in a short time period.

For a broad introduction of computing techniques in the sphere of planning and control the following are necessary:

1. Scientific methods;
2. A qualified collective of workers;
3. Computers;
4. Prepared tasks; and
5. Initial data.

At this time the first three conditions already appear to present no serious obstacles in the way of using computing techniques. Soviet scientists have solved many problems of practical application of mathematical methods in the economy; and the designers have invented a number of computers.

Unsolved remain two important questions: ascertaining the more pressing tasks and accurately defining the conditions of their solution; and determination of initial data. Fulfilling these conditions, we will solve the whole problem of applying computers in planning.

It should be noted that electronic machines and mathematical methods in planning will be effective only when there is at our disposal the most progressive and trustworthy initial data. First of all it is necessary to have the most comprehensive information about basic funds, materials-cost rates, and labor standards in capital construction. The consolidated index rates have to correspond to the existing rates in enterprises. The processing and consolidation of rates is a complicated operation, but even more complicated is the setting up of a permanent system for keeping the index rates up to date. The whole business of rates can be sharply improved if a system of gathering all indexes and processing them by machine automatically is adopted.

With the aid of electronic computers, the Computing Center in a short time will process a large amount of accumulated material and utilize it to solve tasks connected with the processing of current and future plans; verification of the conformance of republic and departmental plans with the approved control figures; processing of material-technical supply plans, specialization, and cooperation; for deciding questions of price formation; etc.

The Computing Center should accumulate normative data on expenditures of labor, energy, and materials on industrial and materials on output, information on the main industrial funds, natural resources reserves, and normative

data on agriculture, trade, transportation and other branches of the economy.

The Computing Center, plans to center its attention on computing estimates and making mathematical decisions to work out -- together with the Central Statistical Administration USSR -- the inter-branch accounts balances of production, the distribution of the national product for 1959, the methodology of drawing up such a planning balance for 1961, and in long-term planning; drawing up a single power balance; material-technical supply; effectiveness of capital investments, as concerns their more rational allocation to branches of the economy, as well as concerning the effectiveness of their utilization by branches and the most important units of the economy; etc. Thus, for example, in setting up a single fuel-power balance, the Computing Center with the aid of mathematical methods has to find the optimum variation of its structure for the whole country and the individual rayons for 1960-1965.

"The existing technical means for the organization and mechanization of engineering-technical and administrative-control workers' labor. Their current status and future production in the USSR." Such was the title of a report given by Yu. I. Shendler, chief of a subsection (podotdel) of Gosplan USSR. The speaker noted that we still produce few calculating and computing machines; and drafting-designing, copying-multiplying, and archive equipment; means of initial calculations, communications, and specialization; control equipment; and others.

In 1965, the level of mechanization and automation of computing work in industry, construction, transport, trade, and other sectors of the economy, and in the state apparatus, should be brought up to 40%; in copying-multiplying work, to 50%; and in project design work, to 60%, of the work to be fulfilled.

Broad application of mechanization of control work creates conditions for a radical improvement in the organization of management by enterprises and institutions. The centralized execution of various control functions will increase significantly, which in turn will permit broadening of the utilization of the shop-less structure, consolidation of shops and sections, uniting of enterprises, and setting up of interconnected and regional centers for processing information on production regulation and control.

The report of L. G. Shershen', chairman of the Technical-Economic Council of the Leningrad Sovnarkhoz, dealt with the status, tasks, and ways of applying mechanization of engineering and administrative-control jobs in



the sovnarkhoz. Work on mechanizing and automatizing those jobs was done in the Leningrad economic administrative area.

The Leningraders have already achieved some successes in applying automation to engineering and administrative-control work. Industrial dispatching is being introduced in 25% of the sovnarkhoz's heavy and medium enterprises. Television and photo-telegraph communications are being employed; calculations, standards computation, and production planning are being mechanized; mechanization of quantity documentation is being introduced; etc. Separate work is being done on high-speed draft duplication, copy-less drawings, and in employing calculating apparatus.

"The Tasks and Perspectives of Complex Mechanization and Automation of production Control in a Heavy Machine-Building Factory" was the title of the report presented by K. V. Stroganov, chief engineer of the Moscow Motor Vehicle Plant imeni Likhachev, and K. P. Ivanov, director of the Scientific Research Institute of Automobile Industry Technology. Currently, reconstruction is being carried out in the Moscow Motor Vehicle Plant imeni Likhachev, with the aim of converting it into a model enterprise as regards technical equipment, economic effectiveness, and working conditions. Simultaneous with overhauling the shop structure and renovating the stocks of equipment, it is planned to raise the level of organization and control of production, which will have great effect on the utilization of new techniques and technology. It is envisaged to carry out in the factory a radical reorganization in the system and methods of operative production control, through wide application of current means of mechanization and automation, first of all in operative planning, calculation, the regulation and control of main production, etc.

It is also envisaged to centralize the planning, economic, technical and other computations, and to provide the production sections with them. The factory's computing center will be equipped with an electronic computer for processing information on planning, calculations, statistics, engineering computations, etc. By applying current technical means of mechanization and automation, the system of operative and initial calculations and control and regulation of production speed, will be radically overhauled.

According to preliminary calculations, the costs for purchasing, designing, manufacturing and installing the means of mechanization and automation of production control in the plant will pay for themselves in 3.5 years.

Four sections worked in the conference. One of the



sections discussed questions of mechanizing calculation, statistical, and planning work.

M. A. Korolev (Moscow Economic - Statistical Institute) dwelt on the employment of electronic computers in planning and calculations, since the extent of information necessary for drawing up plans has increased. For example, if at the present time the size of calculations-planning information in our country is tentatively estimated at 40 billion indices, then by 1975 it can be expected to have increased by roughly 1.5 times.

Comrade Korolev further gave an account of experiments in the application of electronic computers in our country and abroad various methods of their introduction, tasks in preparing specialists to operate the computers, and initial documentation.

N. L. Sariev ("Rostsel'mash") told about experiments in applying the EV 80-3 electronic computer to interfactory planning, calculation, and computation of material-technical supply. This computer does the following computations in the factory: it determines the cost of materials; systematizes the composition of expenditure norms, materials, the allotted time, and wages; determines the sum of losses from discards; etc. The experiment of applying the EV 80-3 to industrial planning and calculation has shown, that it is very profitable and necessary to produce and utilize broadly this type of computer in the economy.

The report of V. D. Rakhman (Moscow Small Motor Vehicle Plant) was devoted to the operation of the EV 80-3 computer in calculating production planning and finished production. With the aid of this machine the factory carries out daily count of spare parts (which in the factory number roughly 2,000); registration of incoming-outgoing papers other tasks, including experimental work -- preparing a daily report in which shops register details, calculating the amount of working time and manpower requirements for fulfilling the program, norm computations, and others.

Experiments in mechanizing calculating-planning work with the aid of key-punch calculators have been carried out in the Moscow Transformer Plant. L. Ye. Sibiryakov told participants of the section about work done in this direction at the factory, and of the economy achieved. Thus, now one third as much time is needed for accounts processing of incoming-outgoing papers, as before mechanization. In 1950, one accounting worker attended 70 workers, in 1960 it was 1:100. The cost of accounting has in these years decreased from 14 rubles 15 kopecks to 7 rubles 37 kopecks per worker. The bookkeeping structure itself

has undergone a sharp change. In 1950, its work was 13% mechanized, in 1960, 73%. The plant has set for itself a task to be completed in the next 3-4 years -- through mechanization of labor to reduce the number of accounting workers to 5 persons per 1,000 workers.

A. F. Tretyakova (Institute of Electronic Control Machines, Academy of Sciences USSR) discussed the planning of optimum haulage by electronic computers. The optimum diagrams for hauling fuel coal on a country-wide scale, and a plan for hauling gravel from docks to construction spots in Moscow, were computed in particular.

Also speaking in the section's sessions were N. V. Belkin, Soyuzmashuchet Ts SU USSR (Soyuzniy Mashinnyy Uchet Tsentral'nogo Statisticheskogo Upravleniya SSSR, -- Union Machine Computation, Central Statistical Administration USSR), F. F. Chaikin (1-GPZ), V. F. Filipov (Mosoblsovnarkhoz -- Moskovskays Oblast' Sovnarkhoz), A. T. Kashpur (Kiev Sovnarkhoz), and others.

More than 50 people -- scientists, economists, workers of enterprises, designers, inventors and others -- appeared at section, joint section, and plenary sessions.

The conference outlined practical ways to mechanize and automatize engineering-technical and administrative-control work, and measures for accelerated introduction of new mechanical and electronic computing techniques in all administration units of the country's economy.